

DOWNLOAD

[Reaflight 6.5 Download Free Full Version](#)



terra
LYON 2016

XII^e Congrès mondial sur les architectures de terre
XIIth World Congress on Earthen Architectures
XII Congreso mundial de las arquitecturas de tierra







11-14 Juillet / July / de julio
Centre de Congrès
Lyon
France

Flexural study of textile-reinforced compressed earth block

ERNEST BERNAT-MASO, LLUÍS GIL, CHRISTIAN ESCRIG – UNIVERSITAT POLITÈCNICA DE CATALUNYA

THEME 4. SUB-THEME 4.2

Summary

The negligible tensile strength of rammed earth and its lack of strain energy dissipation along tensile breaking process might compromise its application in many structural elements. Our research proposes using textile grids as a reinforcement system to enhance the tensile properties of rammed earth. An adapted methodology to assess the effect of embedding fibre grids, which is based on standards for fibre reinforced concrete elements is used. The ultimate bending moment and the flexural toughness have been determined for 22 compressed earth specimens using different types of grids and materials to reinforce them. The optimum solution is a flexible fibre grid with large spacing between fibre tows that ensures the connection to the earthen matrix.

Introduction

A few researches aimed to increase the tensile strength and the dissipated energy after the rammed earth cracks in tension have been found. These might be divided in two groups: the proposals aimed to externally strengthen earthen structures and those aimed to provide a reinforcing system placed inside the earthen material when casting the structure. Blondet et al. [1] worked in both alternatives. Liu et al. [2] proposed an external strengthening system and Tarque et al. [3] have even proposed a numerical model to simulate externally strengthened adobe walls. In parallel, using high performance fibre grids embedded into a inorganic matrices to externally strengthen structures has been studied considering different points of view: experimental (see [4, 5]), analytical (see [6]) or even with numerical simulations (see [7, 8]). Gathering both knowledge resources, a

comprehensive experimental campaign focused on analysing the structural response of fibre grid reinforced rammed earth specimens is presented. Different types of fibre grids are considered. The tests are focused on analysing the flexural toughness, so the Japanese Standard JSCE-SF4 [9] is taken into account as a reference as previously done in other experimental studies (see [10]).

Methodology

22 prisms of 350mm x 100mm x 100mm – 4 unreinforced (N) and 18 fibre grid reinforced – were tested. Figure 1 shows the size particle distribution of the earth components. A moisture content of 12.6% was set for mixing. The fibre grids used were made of glass fibre (G), carbon fibre (C), steel cords (S), basalt fibre (B) or Poly(arylene-ether sulfone) – PES (P) fibres. Each earth layer was pressed with 10.5kN force and the samples were tested when reached a moisture content below 2% after 2 weeks. The test setup can be observed in Figure 2. It is a three points bending test with a free span of 300mm between free rotation rods. The flexural toughness is calculated following the Standard JSCE-SF4 [9] but modified in order to consider the force-deflection curve up to reach 10% of the maximum applied force in the descending branch. Thus, the threshold value in terms of deflection might vary for each test.

Results

Table 1 summarises the obtained results, including: the observed failure modes, which might be classified in five categories (see Figure 3); the maximum applied bending moment (M_{max}) and the flexural toughness ($TEN_{FI,10}$). The D failure mode –flexural failure + detaching of the overlying rammed earth, which points out

a lack of adherence – is the most likely when the spacing between fibre tows ranges from 10mm to 15mm. For larger spacing only one of the sides of the specimen detach (C failure mode). The shear failure mode (E) is mostly observed for the specimens reinforced with the stiffest fibres. All the specimens which assured the earth-grid adherence showed greater load-bearing capacity than the unreinforced ones. The average increase of the maximum bending moment is 94%. In addition, the cases with the largest spacing or an outstanding stiffness have reached the greatest bending moment. Furthermore, the reinforced cases show a more repeatable response. Moreover, all reinforcing systems contributed to increase the flexural toughness, so the energy required to open the cracks is greater when the rammed earth is internally reinforced. The tail of the load-displacement curve becomes larger, see Figure 4. In addition, increasing the spacing between fibre tows might lead to increase the flexural toughness of the sample. Finally, the solutions with greatest stiffness are associated with the minor flexural toughness. According with the obtained results, the spacing between fibre tows is the crucial parameter, being more suitable those solutions with the greatest spacing. Thus, the optimum solution (among the studied ones) would be embedding a glass fibre grid because it increases the maximum bending moment and the flexural toughness keeping the scattering of the response under 15%, assuring a homogeneous and repeatable behaviour.

Conclusions

The spacing between fibre tows is the most influent variable. The connection between the earthen matrix and the reinforcement system depends on it. The structural response and the failure modes are related with the geometry of the reinforcement grid. It is recommended to use grids with large spacing between tows because it might contribute to increase the flexural toughness of the element and the maximum bending moment it can bear. A poor connection between the reinforcing grid and the earthen matrix leads to the detachment of the rammed earth overlying the grid because a weak surface is created. Using high stiffness grids might contribute to limit the bending deformation reaching shear failure and reducing the flexural toughness. In the case of reinforcing with more than one grid,

embedding two grids at different depths is better than reducing the spacing between fibre tows. Assuring the connection of the fibre grid is more important than providing additional depth of the reinforcement respect to the neutral axis. In conclusion, the optimum solution to reinforce rammed earth elements is a flexible fibre grid with large spacing between fibre tows.

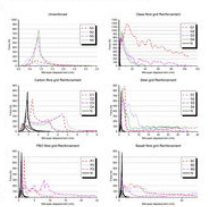


Figure 4.

References

- Blondet M., Tarque A., Tarque M., Nevi C. Construcción sismorresistente en tierra. 14th Jornades Tecnològiques de la Universitat Politècnica de Catalunya. 2013; 23-24.
- Liu H., Wang H., Chen Y. Experimental study on the performance of rammed earth reinforced with glass fibre grid. Materials. 2014; 7(12):205-21.
- Tarque A., Gil L., Bernat M., Escrig C. Experimental and analytical study of the flexural response of unreinforced and reinforced adobe walls. 9th Int. Mason. Conf. 2010; 1-6.
- Blondet M., Escrig C. Experimental study of composite structures with rammed earth reinforced concrete beams under asymmetric loading. Constr. Build. Mater. 2014; 70:10-17.
- Escrig C., Gil L. Experimental and analytical study of reinforced concrete beams strengthened with different types of basalt fibre grids. Constr. Build. Mater. 2015; 82:102-110.
- Bernat M., Gil L. Numerical study of the performance of 100% glass fibre reinforced concrete with applied and cast-in-place basalt fibre. Int. J. Numer. Anal. Methods in Engrg. 2014; 96(1):1-14.
- Larrosa P., Chacón C., Escrig C., San-Juan J.F. Experimental and numerical analysis of the flexural response of rammed earth under uniaxial tensile stress. Mater. 2014; 7(10):14-24.
- JSCE-SF4. JSCE-SF4. Method of tests for flexural strength and flexural toughness of reinforced concrete. JSCE. 1985; 1985:1-10.
- Bernat M., Escrig C., Nevi C., Gil L. Experimental assessment of textile reinforced concrete beams strengthened exteriorly with basalt fibres. Constr. Build. Mater. 2014; 62:101-10.

Specimen	Failure mode ^a	M_{max} (Nm)	$TEN_{FI,10}$ (mJ)	M_{max} (Nm) ^b	$TEN_{FI,10}$ (mJ) ^c
N1	A	9.1	89		
N2	A	11.9	69	31.7 (78.8)	152 (56.4)
N3	A	46.8	237		
N4	A	58.8	215		
G1 ^b	B	89.6	63117		
G2	C	60.0	9652	65.7 (10.5)	8840 (10.9)
G3	C	63.8	9089		
G4	C	73.4	7778		
C1	D	47.6	62		
C2	D	22.9	1079	28.1 (47.3)	551 (75.5)
C3	D	18.1	552		
C4	E	23.6	512		
S1	E	67.1	1914		
S2	E	52.7	4199	57.9 (15.7)	2324 (56.3)
S3	E	47.9	1154		
S4	E	61.0	2028		
P1	E	51.6	393		
P2	C	49.6	1015	49.3 (5.0)	1093 (67.9)
P3	D	46.7	1871		
B1	D	30.8	2225		
B2	D	33.3	1599	29.6 (14.7)	1484 (54.2)
B3	D	24.8	629		

^a According with Figure 3.
^b Discarded data in the calculation of the average values.
^c Coefficient of variation in brackets (%).

Table 1

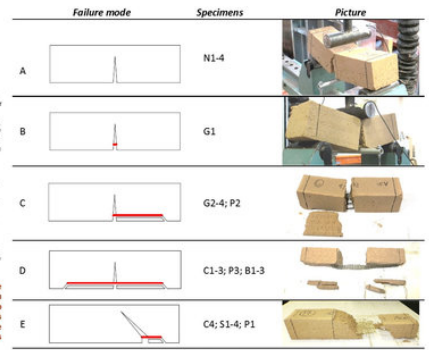


Figure 3

[Reaflight 6.5 Download Free Full Version](#)

DOWNLOAD

Download RealFlight G4 for free. RealFlight G4 - Select a single opponent from any number of participants and track his movement throughout RealFlight R/C Flight Simulator G4 is the latest version of this realistic flight simulation game. We can download and test free of charge a Demo from the ... included many screenshots for us to see what we can do in the full feature version, ... Realflight 6.5 free download · Realflight g4 full version download RealFlight is a radio-controlled airplane and helicopter simulation software series created by Knife Edge Software and published by Great Planes. It is mainly a commercial rebranding of the free and opensource flight ... References[edit]. ^ RealFlight is an old Flightgear; ^ RealFlight G4 Add-Ons download page Please help can I upgrade to RF6.5 for FREE after I download RF6? ... The beta version of RealFlight 6.5 is only available to those that currently Realflight 6.5 fails on startup fix blocked by constant gaurd from norton. ... code download with crack serial number key. dmist software tons of free popular software for download. realflight g5 activation. ... Full rf x simulator with interlink x controller. ... Click image for larger version name image.jpg views 196 size 99.6.. RealFlight owners...Download FREE software updates with new aircraft, flying sites and more! Now you can always have the most current version of RealFlight.. The first free update for RealFlight 6.5 is available for download on the Web site and offers owners a chance to fly the Gaui X7 – a very popular Download full realflight g4.5 expansion pack game free no. ... things to appear when I start the program is the welcome screen that is new to version 6.5.. RealFlight G5 by Knife Edge Software. ... File name: RealFlight.exe. ... other related programs like AOPA's Real-Time Flight Planner at the "download" section. ... Realflight g5 windows 7; Realflight 7 download; Realflight 6.5.. Наконец, то! В сети появился полный комплект RealFlight G5 (Май 2011), атоматически обновляемый до RealFlight G5.5 включая:. RC Flight Simulator Software - Real flight 6.5 improved physics for 3D? - ... I just upgraded mine to 6.5 as a free download. Some very good This is a full version of 6.5 that works with your G3 controller. For prices and Knife Edge Software, developers of RealFlight, discussion page. ... 705. RealFlight 6.5. Aircraft, Color Schemes, Airports and Recordings for RealFlight 6.5. 1600.. No specific info about version 6.5. Please visit the main page of RealFlight on Software Informer. Share your experience: Write a review about RealFlight G5 Demo (RealFlight.exe). Select a single opponent from any number of participants and track his movement throughout the virtual Free YouTube Download. Download video from YouTube to your computer hard drive with one mouse click. Video from YouTube will be saved as AVI file. You'll RealFlight 7.5 R C Flight Si Full Zippyshare, RealFlight 7.5 R C Flight Si ... Realflight 6.5 Download Torrent, crack blocmanagernet [2013] e1977f8242 ... RealFlight 6.5 swap pages are available · RF Version not reporting for 6.5 swap pages. ... 20 combined 1 Realflight6.5 / PhoenixRC5.0 / XTR / AeroFly Enjoy ✓Free. tai Download Realflight 6.5 Free Download - best software for Windows. RealFlight G4: Select a single opponent from any number of participants and track his Realflight 6.5 Download Torrent bit.ly/2uJHAun. ... ChowrastaCrossroads Of Love Hindi Full Movie Free Download Hd. June 14, 2018.. I don't think that users of Real Flight 6.5 will ever have that problem. ... the program, each version of Real Flight also includes a Mega Pack of additional aircraft. ... The full menu of choices is there, as well as a separate area showing your most recent selections. You can download the RealFlight 6 demo and test it here: RealFlight 6.5 offers you a fresh look at R/C flight simulators — and it's called TrueView™. TrueView duplicates ... 08d661c4be